Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Relocation of the 216-220 MHz	)	**ET Docket No. 00-221**
1390-1395 MHz, 1427-1429 MHz	)	**RM-9267**
1429-1432 MHz, 1432-1435 MHz	)	**RM-9692**
1670-1675 MHz, and 2385-1290 MHz	)	**RM-9797**
Government Transfer Bands	)	**RM-9854**

COMMENTS OF PACIFIC CREST CORPORATION

Pacific Crest Corporation, by its counsel, hereby submits these comments in the Notice of Proposed Rulemaking in the above-captioned proceeding which proposes to allocate spectrum in the 216-220 MHz band (and other frequencies not discussed herein) from Government to non-Government use pursuant to the Omnibus Budget Reconciliation Act of 1993 and the Balanced Budget Act of 1997. These comments are directed toward the stated objectives of the Notice - to enable the development of new technologies, and to provide additional spectrum relief for congested private land mobile frequencies.

These comments are also in support of the stated intent of Association of Public-Safety Communications Officials International, Inc. (APCO) and Trimble Navigation Limited, requesting the FCC to allocate spectrum in the 216-220 MHz band for the use of Real-Time Kinematic ("RTK") technology in support of precision Global Positioning Systems. Such an allocation would accelerate the use of this new technology to provide benefits for public safety, disaster recovery, and transportation infrastructure development and management. Primary beneficiaries of this allocation would include federal, state and local entities, as well as private entities that require or provide survey services for the public good.

The principal intent herein is to offer adequate background concerning the nature of RTK activities to provide a foundational awareness for the Commission. We also comment on the size

and growth of the RTK user community and list some of the important activities that the technology enables. Finally, we propose a solution that alleviates the growing congestion in the private land mobile frequencies that are currently being utilized for these activities. We urge the Commission to take action in support of the requirements documented herein through the allocation of adequate spectrum in the 216 to 220 MHz band for RTK activities.

Background

The Global Positioning System provides information that allows individuals to ascertain their position with an ease and accuracy level not previously available. The GPS system was developed by the U.S. Department of Defense as a means to provide real-time position information for logistics and position related activities common in military operations. The civilian sector quickly adopted GPS as a tool for deriving position and timing information for applications ranging from highly precise geodetic surveying to tracking migratory waterfowl. The success of this important emerging technology has been phenomenal, and has resulted in the availability of cost effective, easy to use and highly accurate systems used in wide range of applications.

GPS derived position accuracy is limited by various sources of error. To protect military assets, the Department of Defense instituted an intentional degradation of the GPS signal accuracy, known as Selective Availability (SA). SA was a major source of position information inaccuracy that degraded the civilian accessible position information to an accuracy of approximately 100 m root-mean squared (rms). [1] To increase the accuracy of the system, Differential GPS (DGPS) techniques were implemented. With DGPS, a GPS reference station monitors the signal errors relative to its known location, and broadcasts correction information to mobile or portable GPS receivers. With DGPS techniques, accuracies of 3 to 10 m rms are possible.

[1] SA was turned off by the Defense Department by presidential order in 1998. Unaided GPS system accuracy with SA turned off is approximately 20 m rms.

In the early 1990s, GPS technology evolved to the point of allowing real-time operation with greatly improved accuracies. The techniques implemented to achieve higher levels of accuracy included GPS signal carrier phase measurement. Extending DGPS messages to include the carrier phase correction factors allowed accuracies approaching two centimeters. These high accuracy techniques, known today as Real-Time Kinematic (RTK) GPS, have become adopted by the survey community as an accurate, reliable and cost effective substitute for previous technologies.

In order to achieve RTK levels of accuracy, three important elements are required: 1) carrier phase and other signal error information must be measured at a fixed location by a GPS reference station; 2) the GPS reference station must be located in the proximity of the user (known as the rover). (The maximum separation between the reference station and rover is limited by current technology to approximately 30 miles) and 3) there must be an effective means of transmitting the correction information from the GPS reference station to the rover.

The RTK user community has adopted an approach that relies on portable GPS reference stations used in conjunction with VHF and UHF band radio modems to transmit correction information from the reference station to the roving GPS stations. These systems use non-voice (data) equipment operating under FCC Rules and Regulations. Due to the itinerant nature of survey operations, the majority of users obtain licenses on itinerant business/industrial pool frequencies, and are secondary to voice licensees. Entities not qualified for licensing of these frequencies (e.g. public safety, local and state governments, state Departments of Transportation, etc.) have a particularly difficult time in obtaining suitable frequencies for their operations.

The benefits of RTK over traditional means of surveying include increased efficiency, reduced cost, and timely operation. Timeliness is particularly important to public safety and disaster recovery activities that must occur in difficult environmental conditions that limit traditional survey activities. (Traditional survey activities cannot take place at night, or during inclement weather as the optical devices that are used are not effective in these conditions.)

The RTK GPS User Community

The limited market data available[2] for these emerging applications indicate that there are approximately 000 RTK systems currently in operation in the United States. Professional land surveyors working under contract with public and private projects operate the majority of these systems. Figure 1 illustrates the historical and projected number of RTK systems from 1996 through 2004. Over the next four years, the number of RTK systems in use in the United States is projected to grow more than 135%.

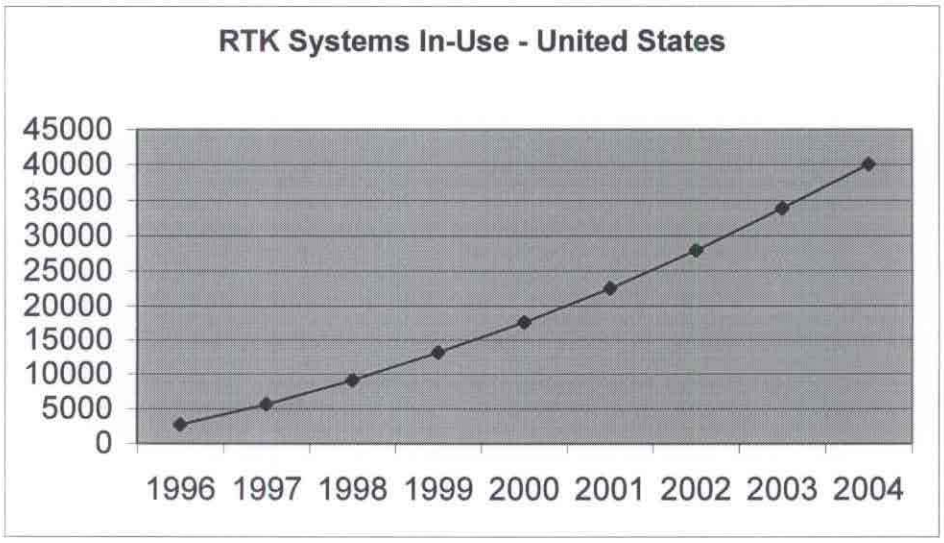

Figure 1

RTK Services

Professional surveyors using RTK provide a variety of important services to the public and private sectors. Beneficiaries of these services include local, state and federal government entities. Services include mapping and marking of legal boundaries and geographic locations in the following categories:

[2] Information derived from GPS 2005, Allied Business Intelligence, 1999

Public Safety / Disaster Recovery

- Public safety infrastructure development and maintenance
- Vehicle location systems (ambulances, fire equipment police vehicles)
- Regulatory compliance
- Crime scene investigation
- Safety analysis and monitoring following natural disaster
- Emergency infrastructure development following natural disaster (roads, bridges)

Construction

- Housing
- Commercial
- Industrial
- Public infrastructure (roads, bridges, overpasses)

Mining

- Deposit demarcation
- Machine placement and control
- Site restoration

Agriculture

- Variable rate application of pesticides and fertilizers
- Yield monitoring
- Forest inventory

The Nature of RTK Transmissions

RTK correction information transmissions take place at a rate of once per second with a transmit duty cycle of 30% to 70% depending on the number of GPS satellites in view and the characteristics of the communication equipment. The radio systems operate on a secondary basis to voice, and observe both station identification and carrier sense multiple access techniques to reduce co-channel user conflicts.

The RF power output is commonly in the range of 2 watts to 35 watts. These ranges provide adequate coverage for short and moderate baseline survey activities. These systems are most commonly operated in the simplex mode, one-way (base transmit, mobile/portable receive-only), but may employ two-way communication to limit interference through power-control. The systems are portable, with the base station frequently set up for operation on a daily basis in proximity to the work site.

The correctional transmission typically operates in a 25 kHz bandwidth channel, with a data throughput requirement of 19,200 bits per second. RTK and radio system manufacturers continue to improve efficiency through data compression and advanced modulation techniques, driving toward the most efficient use of the radio spectrum. Indeed, it is anticipated that transmissions will be able to make use of a 12.5 kHz bandwidth channel.

The Need for Radio Spectrum allocated for RTK Users

The number of RTK system users is increasing at an accelerated rate. Secondary operation on voice-priority channels is problematic, both to the primary channel licensee, and the secondary RTK system user.

State, local and other public entities commonly represented by APCO, do not have access to the business/industrial itinerant frequency pool, and have tremendous difficulties in securing frequencies for RTK GPS usage in many spectrally impacted areas. In many cases, the benefits of RTK are not available to the very communities with the highest need of this emerging technology.

Proposal

Pacific Crest and others interested in the future of RTK activities seek to provide for the growing requirements of radio spectrum to support RTK activities, and to alleviate congestion in the private land mobile radio bands. To meet the current and envisioned data communication requirements, we recommend that the Commission allocate a block of channels in the 216 to 217

MHz band adequate to the needs of this emerging application. Such channels, in order to meet the application requirement, should be spaced at intervals of 12.5 kHz, and allow RF output power not exceeding 35 watts.

Because of the diverse nature of licensees that would be eligible to use these frequencies, including public safety and government users, we propose that competitive bidding is not an appropriate vehicle for license assignment. Further, we propose that the use of the frequencies be limited to survey or other positioning activities. In accordance with current FCC Rules, we also recommend that the equipment be subject to requirements for auto-identification and carrier sense multiple access (CSMA) to further the efficient and cooperative use of the spectrum. We also propose that the equipment be subject to current equipment authorization requirements currently contained within the rules for Part 90 equipment.

Conclusion

RTK is a new application of GPS technology that offers benefits to the public and private sectors. RTK is not possible without a means for transmitting the GPS correction information. . We fully support and endorse the comments of APCO and others regarding an allocation of frequencies for RTK activities as a part of the Commission's reallocation of spectrum in the 216 to 220 MHz band.

Respectfully submitted,

Terry G. Mahn
Robert J. Ungar
Fish & Richardson P.C.
601 13th Street, N.W.
Suite 901 South
Washington, D.C. 20005

Counsel for Pacific Crest Corporation

March 8, 2001